WIKIVERSITY

First Fundamental Law of Physics

The first fundamental law of Physics

"All the phenomena happening in the universe take place under some certain laws of the nature.[1] We have no control on the laws of the nature."[2] This law is the fundamental foundation of physics. The entire physics is founded on this fundamental concept. All other laws of the physics is based on this law. Physics is the subject of experimentation, observation and mathematical modelling of the phenomena of the nature. These methods lead to some conclusions and these conclusions take the form of laws of physics. In physics it is believed that the natural phenomena work under some fundamental laws.[2] These laws are not created by humans, and we cannot change them. We can only learn about them and use our knowledge to predict how the universe will behave.

Background

"The definition of physics itself states that the nature works on some certain laws and investigating these laws is called as physics." [3]This is the foundation of physics on which all other fundamental laws of physics are dependent. The discoveries of all other fundamental laws of physics are the evidences of the First Fundamental Law (or Principle) of physics.

The First Fundamental Law of Physics is supported by the vast amount of evidence that we have gathered about the universe. From the smallest subatomic particles to the largest galaxies, everything in the universe behaves according to certain laws. These laws are not just theoretical; they have been tested and verified by countless experiments.

Illustration by Examples

Here are some examples of the First Fundamental Law of Physics in action:

- The Earth orbits the Sun in a predictable elliptical path.
- The sun will rise in the east and set in the west because of the law of rotation of the Earth.
- A ball thrown into the air will always fall back to the ground due to gravity.
- A pendulum will swing back and forth at a constant rate, regardless of its size or weight.
- The color of light emitted by an atom depends on its atomic structure.
- A magnet will attract a piece of iron.
- Electricity will flow through a wire.

- Light will travel in a straight line.
- The energy released in a nuclear reaction is always equal to the mass lost in the reaction, multiplied by the speed of light squared.
- Atoms emit and absorb light at specific wavelengths because of the laws of quantum mechanics.

Validity

It is valid from the both points of views of experimental conclusions and philosophical concepts. The famous physicist Richard Feynman, in his well known book "The Character of Physical Law" writes:

"There is also a rhythm and a pattern between the phenomena of nature which is not apparent to the eye, but only to the eye of analysis; and it is these rhythms and pattern which we shall call ***Physical Laws***."[4][5]

The First Fundamental Law of Physics is based on the observation that the universe is consistent and predictable. If the universe were not governed by laws, then we would not be able to make any predictions about how it would behave. For example, if the laws of gravity were to change suddenly, then we would fall to the ground in unpredictable ways.

The First Fundamental Law of Physics also implies that there are limits to what we can control in the universe. We can learn to understand and harness the laws of nature, but we cannot change them. For example, we can learn to build airplanes and rockets to fly through the air, but we cannot change the laws of gravity that make these vehicles possible.

Importance

The First Fundamental Law of Physics is important because it gives us a foundation for understanding the universe. It tells us that the universe is not chaotic or random, but rather that it is governed by orderly and predictable laws. This knowledge allows us to make predictions about the future behavior of the universe, and to develop technologies that can be used to harness the forces of nature.

The First Fundamental Law of Physics is one of the most important laws in science. It is the foundation upon which all of physics is built. It is also a reminder that we are part of a larger universe that is governed by laws beyond our control.

Mathematical modelling

We may express the principle mathematically by some hypothetical assumptions and analysis. First of all we will define some variables for the hypothetical assumptions.

- Phenomena: Let's represent each phenomenon occurring in the universe by a variable, say P_i .

Where 'i' is an index representing the specific phenomenon.

- Laws of Nature: Let's represent the laws of nature by a set of functions, denoted by L_j.

Where 'j' is an index for each law.

The first part of the principle

The first part of the principle implies that every phenomenon P_i is governed by at least one law of nature L_j. We can express this using the following notation:

$$\forall P_i, \exists L_j : P_i \subseteq L_j$$

Where,

$\forall$ represents "for all"

$\exists$ represents "there exists"

$\subseteq$ represents "is governed by" or "is a subset of the conditions defined by"

The second part of the principle

The second part of the principle signifies that the laws of nature L_j are independent of human intervention or control. We can represent this by stating that the laws of nature are constants:

$$\forall L_j, L_j = constant$$

From **the combination of the both parts of the principle**

The complete mathematical expression of the statement would be:

$$\forall P_i, \exists L_j, P_i \subseteq L_j \land \forall L_j, L_j = constant$$

It is a possible mathematical modelling of the "**First Fundamental Law of Physics"**.

References

1. "The Basics of Physics". *www.coursehero.com*. Retrieved 2023-09-13.
2. Verma, H. C. (2015). Concepts of Physics - Vol. 1. India: Bharati Bhawan.
3. Orear, Jay (1967). *Fundamental physics*. Internet Archive. New York, Wiley. http://archive.org/details/fundamentalphys000orea.
4. Frisch, Mathias (2014-05). "Laws in Physics". *European Review* **22** (S1): S33–S49. doi:10.1017/S1062798713000768. ISSN 1062-7987. https://www.cambridge.org/core/journals/european-review/article/laws-in-physics/4F0ADE6682DBA4E4805B376C4151E71B.
5. Kiefer, Claus (2014-05). "On the Concept of Law in Physics". *European Review* **22** (S1): S26–S32. doi:10.1017/S1062798713000756. ISSN 1062-7987. https://www.cambridge.org/core/journals/european-review/article/on-the-concept-of-law-in-physics/D31200246AD6B0783BCD5B99B55BDF26https://www.cambridge.org/core/journals/euro

pean-review/article/on-the-concept-of-law-in-physics/D31200246AD6B0783BCD5B99B55BDF26https://www.cambridge.org/core/journals/european-review/article/on-the-concept-of-law-in-physics/D31200246AD6B0783BCD5B99B55BDF26.

Retrieved from "https://en.wikiversity.org/w/index.php?title=First_Fundamental_Law_of_Physics&oldid=2695316"